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THE INFLUENCE OF MENTAL WORK ON THE VISUAL MEMORY IMAGE.

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First Series:

The problem is the comparison of the mental image in the morning and at night. The experiments were made before the observer started his mental work or a short time after starting, and were repeated after a day's mental work. One morning experiment and one night experiment were always made on the same day. In the morning as well as at night the experiments were carried on in the following way. A certain drawing[1] was exposed five seconds. Then the observer closed his eyes and waited thirty seconds in order to avoid after-images of the drawing and of stimuli which might excite him by chance. The observer was told not to think of the picture during the thirty seconds. The experimenter generally tried to distract him by inquiring about the work the observer had done before the experiment. At the end of the thirty seconds the signal "Try to call it up now," was given. The signal was given so that "now" followed one second after "try." The observer then tried to call up the memory image. As soon as he succeeded in seeing it, he pressed a key. The instant the image disappeared he released the key. The pressing and releasing of the key was recorded by a pointer on a kimograph. Time was measured by a metronome. The instruction given to the observer was: "Press the key as

[1] The drawings are described on p. 357.

soon as you *see* anything of the image at all, and only if you *see* it." The first time the instruction was given the experimenter asked if the observer was able to distinguish between *thinking* of the image and *seeing* it. The observer generally found no difficulty in making this distinction. Each time an observer was doubtful as to whether he really saw the image or only thought of it, a note was taken. The observation[2] took thirty seconds, at the end of which time a short introspection was required. There was no special instruction given for the introspection. The experimenter was afraid that any question might be suggestive, and therefore asked only for introspection as such. At each sitting the observation was repeated three times. There was a difference, however, between the first observation and the second and third, in that the drawing was not exposed again to the observer. The time between the second and first as well as between the second and third observation was determined by the duration of the introspection.

It is evident that the first observation takes place under conditions different from those of the second and third observation. It is improbable however that the first observation has to do with the so called primary memory image or memory after-image, as it is usually assumed that the primary memory image does not last longer than 20 or 30 seconds.[3] The motive for making the first observation different from the two succeeding observations was to observe the influence of mental work on the memory image under different conditions. We chose the long exposure of five seconds in order to be sure of a thorough acquaintance with the picture. The experiments are not memory experiments but experiments about the mental image. The special kind of mental image, memory image, was decided upon, because it allows greater control of experimental conditions than the imagination image.

Eight observers (*A, B, C, D, E, F, G, H*) took part in the series. One of the observers was an instructor, five were graduate students, and two were undergraduates of Columbia University. *A, B, C, D* served throughout the whole experi-

[2] When we speak in the following about an observation we always mean observation as described here. Thus the time the observer keeps the images during an observation is different from the time a single image lasts unless the observation contains only one image.

[3] J. W. Slaughter, "A Preliminary Study of the Behaviour of Mental Images." *Am. Jour. Psychol.*, 1902, 13, p. 530, and Alma de Vries Schaub, "On the Intensity of Images," *Am. Jour. Psychol.*, 1911, 22, p. 354.

ment (five times), including both morning and evening sittings. As each experiment comprises three observations, each of these subjects observed fifteen times in the morning and fifteen times at night. Observers *E, F, G, H* performed only three morning and three night experiments each, thus observing nine times in the morning and nine times at night. Altogether 192 observations were recorded.

In the experiments with *A, B, C, D, G,* and *H* the picture used as stimulus was a simple geometrical figure, red with black outlines. It was the figure which is obtained by drawing three half circles around three equidistant points of a circle, using the radius of the original circle for the three half circles. The radius was *2 cm.* The coloring was done by crayons. It seemed desirable to find how far the results obtained with this picture were independent of the special drawing. Three pictures were therefore devised which differed from the first in the following respects. Whereas the first picture was a purely geometrical figure, the three other pictures were drawings of objects. Whereas the first picture was red, the three other pictures showed as main coloring green or blue or yellow. The second picture, representing a leaf, had, like the first only one color besides the black outline. The third picture, a duckling, had a yellow body, red feet and beak, and a faint green base. The last picture was a blue flower with a yellow centre. The first picture was used for all observers with the exception of *E* and *F*. Observers *E* and *F* were shown picture *2* on the first day, picture *3* on the second day, and picture *4* on the third day. It must be admitted that the conditions for the morning and night experiments were not the same in the experiments with the last two observers. The picture when exposed in the morning was an unknown one, whereas it was familiar to the observer at the beginning of the night experiment. In the experiments with picture *1*, the same picture was used over and over again; and from the second day on, it was already familiar in the morning experiment. As no difference was found between the experiments where only one picture was used, and the experiments where a different one was used every day, we are justified in neglecting this irregularity in the experiments with changing pictures.

The time which intervened between the morning and night experiments was for observer *A, 9* hours; for observer *B, 12* hours; for observer *C, 6* hours; for observer *D, 8* hours; for observer *E, 8* hours; for observer *F, 10* hours; for observer *G, 8* hours; and for observer *H, 7* hours.

Quantitative Results:

The results are given in tables *1*, *2*, and *3*. Table *1* gives the averages for all three observations; table *2* shows the results of the observations with exposition, the first observations; and the third table contains the figures for the two observations without exposition. The first column gives the number of observers, the second the number of observations. Then follows the average time the image is kept in one observation. The next column shows the average duration of a single image found by dividing the whole time the image is kept during all experiments by the number of images of all experiments together. Column five contains the average number of images for one observation, and column six gives the average time necessary to arouse the first image. The figure for the night experiment is always placed beneath that of the morning experiment; time is given in seconds; the figures in parenthesis give the average deviation. With but one exception (*G* in table *2*) the figures for the time an observer can keep a mental image during thirty seconds are longer in the morning than in the night experiments. With three exceptions (*C* in table *3*; *G* and *D* in table *2*) the duration of the single image is longer in the morning than in the night experiments. These exceptions appear only in tables *2* and *3*. They disappear as soon as we take all experiments together as in table *1*. This fact justifies the assumption that the exceptions are due only to the small number of observations, and thus justifies the conclusions:

1. The time an observer can keep a mental image during a certain period is longer in the morning than at night.

2. The duration of a single image is longer in the morning than at night.

The figures for the number of images are not so evenly distributed. We find in each table cases where the number of images is smaller in the morning as well as cases where it is larger. There is, however, a general tendency for the images to be more numerous in the morning experiments. We thus conclude:

3. The number of images aroused during a certain period tends only very slightly to be larger in the morning than at night.

The same condition obtains with the time required to call up the first mental image. The figures allow the conclusion:

4. The time required to call up the first mental image tends only very slightly to be larger at night than in the morning.

The fact that the results for the arousal are much less regular than those for the duration is in harmony with a remark of Burtt: "It may be noted in passing that the whole series of experiments on imagery indicates that the time of holding is a much better criterion by which to judge the influence of various factors upon imagery, than is the time of arousal."[4]

Another way to compare the different factors with regard to their sensitiveness as indicators of mental work is to consider the ratios of the figures from the morning and night experiments of all observers together. Table *4* gives the figures for the first, second and third observations, and their sum for all observers. As the time for the arousal is longer at night than in the morning, we have to take the reciprocal values (as indicated in parenthesis) in order to make a comparison possible. We find little difference between the ratio for the time the image is kept and the duration of the single image. We notice, however that the ratio is somewhat steadier for the time the image is kept since the deviation for the first, second, and third observation is *—8, 0, +7*, whereas it is *—7, —6, +16*, for the duration of the single image. Contrary to our expectations from the first three tables, the time for the arousal of the first image is a better indicator than the time the image is kept and the duration of the single image. The ratio of the sums is as high as *1.72*. The explanation lies in the fact that the time for the arousal does not differ regularly in the morning and night experiments, but once being different at all, generally shows a great difference.

Another way of comparing the sensitiveness of the different factors in regard to the influence of mental work is the percentage of experiments that show the one or the other of the factors influenced by the mental work. The time the image is kept is longer in the morning than at night in *87.5%* of the experiments, shorter at morning than at night in *12.5%*. The same relation obtains with the duration of the single image; *87.5%* of the experiments give smaller figures in the morning and *12.5%* give smaller figures at night. The number of images is found to be smaller at night in *50.0%*, larger at night in *41.0%* and equal in *9.0%*. The time necessary for the arousal of the first image is in *69.0%* shorter, in *28.0%* longer and equal in *3.0%*. These figures support the result gained before i. e. that the time the image is kept and the duration of the single image are equally sensi-

[4] Harold E. Burtt, "Factors which Influence the Arousal of the Primary Visual Memory Image." *Am. Jour. Psychol.*, 1916, 27, p. 96.

tive factors with regard to the influence of mental work. The number of images is hardly influenced at all. The time the image is kept in one observation, the duration of the single image, and the number of images are not independent factors, but limited by the relation $\frac{\textit{time the image is kept}}{\textit{number of images}} = \textit{duration of the single image}$. Thus as long as the number of images is not influenced by the mental work the time the image is kept and the duration of the single image must be equally sensitive factors. On the other hand, in so far as the duration of the single image is less sensitive than the time the image is kept in one observation, the number of images shows the influence of the work. The last factor, the arousal of the first image, shows quite a considerable surplus of cases with quicker arousal in the morning. It is, however, not as good an indicator as the duration of the images. This fact supports the explanation given above for the discrepancy between the figures of the first three tables and those of the fourth table. The arousal is not always influenced, but, once having been affected, shows this influence stronger than any of the other factors.

Giving the figures for the first, second, and third observations separately, Table *4* allows a comparison of those three different observations. As already mentioned, only the first observation of each experiment was preceded by an exposure of the objective picture. The observation followed thirty seconds after the exposure. The other observations followed as soon as the introspection was finished. We find that the ratios for the first, second, and third observations increase from the first to the second, and from the second to the third in the columns for the time the image is kept, as well as in the columns for the duration of the single image. Those columns that give the number of images do not allow any comparison because they vary in an irregular way and only slightly from *1*. Apparently the data for the arousal of the first image follow the same regularity as those of the columns for the time the image is kept and the duration of the single image. But this regularity is only apparent. The smaller the ratio, the greater is the difference between the morning and the night experiment. Thus while for the time the images are kept and the duration of the single image the first observation is less sensitive than the second, and the second less than the third, we find the opposite results with the time for the arousal of the first image. Here the third observation is a better indicator than the second, and the second better than the first.

In order to see if the ratio is influenced by practice we separate observer *A*, *B*, *C*, and *D* who went through five experiments from *E*, *F*, *G*, and *H* who performed only three experiments. Table 5 gives the ratio for the time the image is kept in the first two rows. The first row contains the quotient of the sums of *A*, *B*, *C*, and *D's* figures. The second row shows the ratio of the sums of *E*, *F*, *G*, and *H's* figures. In the same way the third and fourth row give the duration of the single image, and the fifth and sixth row the ratios for the time necessary to arouse the first image. We find neither a decrease nor an increase.

It may be noticed in passing that this arrangement too yields only ratios that are greater than 1. This means that if we combine the figures for all observers for a single day we always obtain for the time the image is kept and for the single image a greater duration in the morning than at night, and for the time necessary to call up the first image, a longer duration at night than in the morning. It will be understood that Table 5 gives the reciprocal values for the arousal of the image; this means that the ratio is found by dividing the evening value by the morning value.

The number of observers is too small to justify general conclusions regarding the influence of the number of working hours between the morning and the evening observations, on the difference of the results. It is nevertheless quite interesting to compare the data in relation to this factor. If x is the average of the duration of the images in the morning, and y that of the images at night, then $\frac{x+y}{x-y}$ will be smaller the greater the difference of x and y. This quotient will be a definite value for each observer. A second value for each observer is found in the number of hours that passed between the morning and evening observation.[5] If we correlate these two series of values according to the product-moment's method of Pearson (omitting observer *G*, in regard to which see table 2) we obtain $r = -0.50$, with a probable error ± 0.19.[6] The coefficient suggests that the greater the time interval the greater the difference between morning and evening

[5] It is evident that the number of hours passed between the two experiments is no correct measure for the work done. Most of the hours were spent studying, going to lectures or lecturing. But occasionally the observer reported a walk or some other rest between.

[6] If we take $\sigma = \sqrt{\frac{\Sigma (d)^2}{r-1}}$ instead of $\sqrt{\frac{\Sigma (d)^2}{r}}$, $r = -0.41$.

observation. Including observer *G* we obtain the coefficient $r = -0.18$,[7] with a probable error of ± 0.23.

It might be objected that the difference between the morning and night experiments is not caused by differences in the subjects but by difference in the light. A great part of the experiments at night was carried on by artificial light, whereas natural light was generally used in the morning. Observer *H*, however, did all experiments by natural light; and her data do not differ from those of the other subjects. This fact suggests that the differences are not due to different light. Even if we assume that it was somewhat darker in the afternoon experiments than at morning the probability of getting better images at night would be greater than the opposite. Wundt states that "unsere Erinnerungsbilder sind im Dunkeln oder Halbdunkel ungleich lebendiger als im Licht des Tages."[8]

Qualitative Results:

If we compare the images in regard to color, shape, outline, clearness, vividness, and ease of evocation, we find only three observers whose images before the mental work and after the mental work differ markedly in most of these respects. They are observers *B*, *E*, and *H*. Even with these observers, not every image in the morning observation was good nor every image in the evening observation poor. But in general the images were better in the morning. With observer *B*, the most conspicuous fact is that he found it very hard to call up an image at night. "I could not get it at all, it was very hard to call it up." "I could not get a thing, perfectly blank." "It was just a sort of brown all over, not sharp outlines as this morning," were his reports. No remark of that kind occurred in the morning observations. The images at night were not only hard to call up, but they were vague, blurry, and poor in colors. "No color or anything, just vague blur." Observer *E* too had great difficulty in getting any color at night. "It did not have the color characteristics, and I could not get them although I kept thinking of black and green." "I could not seem to get any color there. It was just a shadowy bird, a grayish bird." We find quite a different introspection in the morning observations. "The yellow centre seemed to stand out most sharply; it was a

[7] For $\sigma = \sqrt{\frac{\Sigma (d)^2}{r-1}}$, $r = -0.16$.

[8] W. Wundt, Elemente der Völkerpsychologie, 1912, p. 25.

more saturated yellow than in the original," is typical of the replies. The difference in the other qualities is not quite so conspicuous as that of the coloring but nevertheless stands out quite clearly. I quote a few more descriptions given by *E* in the night experiments. "That was so exceedingly faint and indefinite when I got it that I am almost inclined to doubt if it was an image at all." "It was a fluctuating shadow; it did not have any sharply defined circumference." A few morning introspections follow: "I had no difficulty at all in getting a splendid image. I never lost it completely. It just seemed to become a little fainter, and then become very clear again." "I immediately got a very satisfactory image, and it remained." "It seemed to be a perfect representative of the objective design." Observer *H* shows the same marked difference in colors as observer *E*. She mentioned color only once at night and on that occasion she reported only: "Not much color." There is on the other hand, not a single morning observation without color. Reports ran, "The colors were very bright," or "The colors were very clear and vivid." She too found it hard to call up the image at night. In only one night observation do we find that it was not hard to call up the image, whereas we find several morning introspections like the following: "I found it awfully easy to call the image up." "Easy to get the image." Her images were in general distinct and clear in the morning and indistinct and fluctuating at night. "It was not nearly as clear as in the morning." Observer *A's* images were poor in the morning as well as at night. The only difference seems to be that she very often describes her images at night as fleeting. There is only a very slight difference with *F*, and it is doubtful if there is any difference at all with *C*, *D*, and *G*.[9]

Before concluding series *1*, two observations may be pointed out which although not connected with our problem, are of interest for the psychology of the visual memory image. The time the image is kept is longer in the first than in the second observation, and longer in the second than in the third observation. This obtains for the morning as well as the night experiment. The same regularity is repeated in the night experiments for the duration of the single image.

[9] On the whole our experiments do not agree with Murray's results: "It soon became evident....that distinction and vividness were more constant and more significant factors than mere duration and recurrence." E. Murray, "Peripheral and Central Factors in Memory Images of Visual Form and Color." *Am. Jour. Psychol.*, 17, 1906, pp. 227 f.

The morning experiments, however, yield only the result that the first observation is superior to the average of the two following observations. Again the number of images does not show any regularity. The time for the arousal increases from the first to the second and from the second to the third observation, thus proving like the duration, that the first observation is superior to the second and the second to the third.

The second remark concerns the effect of practice. Table 6 separates those observers that observed only three times from those that observed five times. The table gives the time the images are kept and the time necessary for the arousal of the first image. The figures for the subjects that observed only three times seem to suggest some practice effect but this suggestion is not supported by the subjects that observed five times. This result is in harmony with Foster's remark: "In no case did practice increase the ability or even the tendency to visualize."[10] Since the subjects that observed five times are more reliable than the other observers, it is even possible to see in Table 6 an indication that the mental image deterioriates with practice. This would support the often stated laboratory experience that the more an observer occupies himself with mental imagery the harder he finds it to call up a satisfactory image.

Second Series:

The problem here is the comparison of the visual memory image before and after a short time of intensive mental work. The intensive work consists in adding after Starch's method.[11] The adding was done for half an hour. The observer was told to do the adding as correctly and as quickly as possible. One undergraduate student of California and one graduate student of Columbia University took part in the experiment. The experiments in general were carried on in the same way as those described in the first series. The main difference lies in the fact that we compare the observations before and after the adding instead of those in the morning and at night. One of the observers (*I*) performed

[10] W. S. Foster, "The Effect of Practice upon Visualizing and upon the Reproduction of Visual Impressions." *Jour. Ed. Psychol.*, 1911, 2 p. 11.

[11] "The experimenter announced to the observer a number consisting of two digits. The observer then added 6 to this number, then 7 to the new sum, then 8 to that, and then 9, and then again 6, 7 8, and 9 in rotation...." D. Starch, *Experiments in Educational Psychology*, pp. 36 f.

one observation before and one after the adding. The other observer (K) observed twice before and twice after the adding. The results are given in Table 7. They show:

1. *The time the images are kept during one observation is longer before than after the work.*
2. *The average duration of the single image is longer before than after the work.*
3. *The number of images tends only very slightly to be larger before than after the work.*
4. *The time for the arousal of the first image is in one case much shorter before than after the work; in the other case it is not influenced at all by the work.*

So far as two observers allow a generalisation, the results show that mental work tends to vitiate the visual memory

TABLE I

1	2	3	4	5	6
Observer	Number of observations	Average time the image is kept in one observation	Average duration of the single image	Average number of images	Average time for the arousal of the first image
A	15	8.2 (1.6)	1.2	6.6 (0.8)	1.8 (0.8)
	15	5.2 (1.1)	0.9	6.1 (0.9)	1.9 (0.8)
B	15	18.6 (2.4)	8.7	2.1 (0.6)	5.2 (1.1)
	15	4.5 (2.7)	2.8	1.6 (1.0)	16.8 (7.3)
C	15	9.5 (4.3)	1.7	5.7 (2.3)	6.9 (6.4)
	15	7.6 (3.2)	1.6	4.7 (1.4)	5.0 (4.0)
D	15	24.3 (1.8)	5.7	4.3 (0.8)	0.7 (0.4)
	15	22.0 (3.9)	5.1	4.3 (1.2)	0.6 (0.3)
E	9	17.1 (4.9)	4.9	3.5 (1.1)	4.9 (2.6)
	9	8.9 (3.4)	2.7	3.3 (1.0)	10.8 (4.8)
F	9	25.2 (1.1)	6.3	4.0 (0.6)	1.9 (0.5)
	9	21.1 (2.0)	4.0	5.2 (1.4)	2.8 (0.5)
G	9	6.8 (3.2)	1.1	6.1 (0.8)	0.8 (0.3)
	9	6.7 (3.7)	1.0	6.9 (1.0)	0.8 (0.4)
H	9	9.9 (3.5)	2.3	4.3 (0.5)	3.0 (0.9)
	9	6.2 (1.1)	1.2	5.1 (0.6)	5.7 (0.9)

image; this result agrees therefore with our first series of experiments. In regard to the sensitiveness of the different factors, too, this series supports the results of the first series. The time the image is kept and the duration of the single image are the best indicators for the influence of the mental work on the image. The number of images hardly shows any influence at all, and the time necessary for the arousal is very unreliable. Here again those factors that are fine indicators, the duration of the single image and the time the image is kept, are more sensitive in the second than in the first observation.

As in the case of our first series, so here too we find a few observations that do not pertain to the problem in question, but are of interest for the psychology of the memory image. Comparing the first and the second observation of

TABLE 2

1	2	3	4	5	6
Observer	Number of observations	Average time the image is kept in one observation	Average duration of the single image	Average number of images	Average time for the arousal of the first image
A	5	9.0 (1.4)	1.3	6.8 (1.0)	1.8 (0.8)
	5	5.4 (1.1)	0.9	5.8 (0.6)	1.2 (0.4)
B	5	17.9 (2.3)	8.1	2.2 (0.6)	5.2 (1.2)
	5	6.4 (3.9)	3.6	1.8 (1.0)	16.6 (8.0)
C	5	9.3 (4.3)	1.7	5.6 (1.9)	4.3 (2.4)
	5	6.4 (3.9)	1.5	4.4 (1.3)	6.0 (4.6)
D	5	24.1 (1.9)	6.0	4.0 (0.8)	0.9 (0.4)
	5	22.5 (4.4)	6.3	3.6 (0.7)	0.7 (0.5)
E	3	18.2 (1.8)	5.5	3.3 (0.4)	3.3 (1.1)
	3	11.7 (3.8)	3.2	3.7 (1.1)	6.5 (1.7)
F	3	26.7 (0.6)	6.7	4.0 (0.7)	1.5 (0.3)
	3	22.2 (2.2)	4.1	5.3 (1.8)	2.2 (0.2)
G	3	4.5 (1.3)	0.8	6.0 (0.0)	1.0 (0.3)
	3	7.0 (3.3)	0.9	7.7 (1.1)	1.3 (0.5)
H	3	11.3 (3.3)	2.6	4.7 (0.6)	2.2 (0.2)
	3	6.0 (0.8)	1.1	5.3 (1.3)	6.7 (0.5)

observer K we find that the image is poorer in the second observation than in the first. This difference obtains throughout, and for the experiment before the adding as well as for that after the adding. Comparing the different days we see that there is neither a decrease nor an increase of the time the image is kept in one observation (Table 8).

TABLE 3

1	2	3	4	5	6
Observer	Number of observations	Average time the image is kept in one observation	Average duration of the single image	Average number of images	Average time for the arousal of the first image
A	10	7.8 (1.6)	1.2	6.6 (0.7)	1.8 (0.6)
	10	5.2 (1.1)	0.8	6.4 (1.2)	2.1 (0.9)
B	10	18.9 (2.4)	9.0	2.1 (0.5)	5.3 (1.2)
	10	3.6 (2.1)	2.4	1.5 (1.0)	17.0 (6.7)
C	10	9.6 (4.5)	1.7	5.7 (2.5)	8.3 (8.5)
	10	8.2 (3.3)	1.7	4.8 (1.4)	4.5 (3.8)
D	10	24.4 (1.7)	5.6	4.4 (0.8)	0.6 (0.3)
	10	21.6 (3.5)	4.6	4.7 (1.3)	0.6 (0.3)
E	6	16.7 (6.3)	4.8	3.5 (1.3)	5.8 (3.1)
	6	7.6 (2.4)	2.4	3.2 (0.8)	13.0 (5.8)
F	6	24.5 (0.8)	6.1	4.0 (0.8)	2.1 (0.6)
	6	20.6 (1.6)	4.0	5.1 (1.2)	3.1 (0.3)
G	6	8.0 (4.0)	1.1	6.2 (1.2)	0.6 (0.5)
	6	6.5 (3.8)	1.0	6.5 (0.8)	0.6 (0.3)
H	6	9.1 (3.1)	2.2	4.3 (0.5)	3.3 (0.8)
	6	6.3 (1.3)	1.2	5.0 (0.4)	5.2 (0.7)

TABLE 4

Observation.		1	2	3	Σ
Time the image is kept;	morning	483.50	479.50	475.24	1438.25
	night	344.25	323.00	307.00	974.25
	ratio	1.40	1.48	1.55	1.48
Duration of the single image;	morning	3.31	3.15	3.30	9.76
	night	2.39	2.27	2.05	6.71
	ratio	1.38	1.39	1.61	1.45
Number of images;	morning	146	152	144	442
	night	144	142	150	436
	ratio	1.01	1.07	0.96	1.01
Time for the arousal of the first image;					
	morning	84.50	100.00	130.50	315.00
	night	171.75	180.00	189.75	541.50
	ratio	0.49	0.56	0.69	0.58
		(2.08)	(1.78)	(1.45)	(1.72)

TABLE 5

Day:		1	2	3	4	5
Time the image is kept	(A, B, C, D)	1.60	1.48	1.41	1.44	1.85
	(E, F, G, H)	1.44	1.22	1.43	....	....
Duration of the single image	(A, B, C, D)	1.27	1.05	1.55	1.42	1.58
	(E, F, G, H)	1.85	1.25	1.64	....	....
Time necessary for the arousal	(A, B, C, D)	1.40	2.01	1.06	1.31	2.45
	(E, F, G, H)	2.02	1.68	2.02	....	....

TABLE 6

Day		1	2	3	4	5
Time the images are kept	Morning	187.50	183.75	171.75	177.75	187.00
	Night	117.25	124.25	121.75	123.25	101.75
	Σ	304.75	308.00	293.50	301.00	288.75
Arousal	Morning	30.00	34.75	54.50	51.00	49.50
	Night	42.00	70.00	57.50	66.75	122.25
	Σ	72.00	104.75	112.00	117.75	171.75
Time the images are kept	Morning	167.75	137.75	224.25	.....	.....
	Night	116.75	112.75	156.50	.....	.....
	Σ	284.50	250.50	380.75	.....	.....
Arousal	Morning	40.25	33.75	21.25	.....	.....
	Night	81.25	56.75	43.00	.....	.....
	Σ	121.50	90.50	64.25	.....	.....

Time is given in seconds. The figures represent the sums of *A*, *B*, *C*, and *D* in the upper half, and the sums for *E*, *F*, *G*, and *H* in the lower half.

TABLE 7

Observer	Number of observations	Average time the image is kept	Average duration of the single image	Average number of images	Average time necessary for the arousal of the first image
I. before the work:	6	14.4 (3.6)	12.4	1.1	7.5
after the work:	6	7.2 (2.9)	7.2	1.0	12.8
ratio:		1.96	1.72	1.1	1.71*
K before the work:					
first observation	5	6.4 (1.2)	1.0	6.6	1.9
second observation	5	4.6 (0.9)	1.0	5.6	3.4
Σ : 2		5.5	1.0	6.1	2.65
after the work:					
first observation	5	5.6 (1.0)	0.9	6.0	2.6
second observation	5	3.9 (0.4)	0.7	5.4	2.7
Σ :2		4.75	0.8	5.7	2.65
ratio: first observation		1.14	1.11	1.1	0.73*
second observation		1.18	1.43	1.04	1.26*
Σ		1.16	1.25	1.07	1.00

Time is given in seconds. The figures in parenthesis give the average deviations. The figures with the * are gained by dividing the figures after the work by the figures before the work.

TABLE 8

TIME THE IMAGES ARE KEPT

Observer: Day:	1	2	3	4	5	6
I. before the work:	15.00	22.50	7.50	11.00	16.50	13.50
after the work:	6.00	14.50	7.00	6.00	1.00	8.50
K. before the work:	4.75	14.25	4.50	6.75	4.75	.....
after the work:	5.25	4.75	6.00	4.00	4.00	.....
Σ before the work:	19.75	36.75	12.00	17.75	21.25	.....
Σ after the work	11.25	19.25	13.00	10.00	5.00	.....
$\Sigma\Sigma$:	31.00	56.00	25.00	27.75	26.25	.....

TABLE 8—Continued

AROUSAL OF THE FIRST IMAGE

Observer: Day:	1	2	3	4	5	6
I. before the work:	9.50	2.50	7.00	12.00	5.50	11.50
after the work:	9.50	10.50	18.00	10.50	12.00	16.50
K. before the work:	1.25	2.00	3.00	4.00	2.25	.....
after the work:	1.25	3.00	2.25	4.25	2.25	.....
Σ before the work:	10.75	4.50	10.00	16.00	7.75	.....
Σ after the work:	10.75	13.50	20.25	14.75	14.25	.....
$\Sigma\Sigma$:	21.50	18.00	30.25	30.75	22.00	.....